FCS System of Systems' Engineering and Integration

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Key Tenets of the Program

- Create Opportunity for ***Best of Industry*** to Participate
- Leverage Government ***Technology*** Base to Maximum Extent
- ***Associate*** On-Going Enabling Efforts With LSI-Led Activity
- ***Collaborative Environment*** from Design Through Life Cycle
- As a Minimum, ***Commonality*** at Subsystem/Component Level
- Design/Plan for ***Technology Integration and Insertion***
- Maintain and Shape the ***Industrial Base*** for the Future
- Retain ***Competition*** throughout Future Force Acquisition
- Appropriate ***Government Involvement*** in Procurement Processes
- Consistent and Continuous ***Definition of Requirements***
- Maintain and Shape ***Government Acquisition*** Community
- Program ***Affordability — Balance*** Performance and Sustainment

FCS is a Complex System of Systems in a Transformational Warfighting Context

System of Systems' Approach

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Demonstrate Government and Industry Integrated Management and Associated Products

- **System-of-Systems Integration**
- **Business and Contract Integration**
- **Simulation and Test Integration**

- **Clearly and Unambiguously Empower the Systems' Engineering and Integration and Software Integration Activities as the Cornerstones Upon Which the Program is Built**

- **Address Hierarchically and Temporally, With Special Emphasis on Allocation of Requirements, then to Build, Verification, Deployment, and Support at the System-of-Systems Level**

Objective - An Integrated Unit of Action

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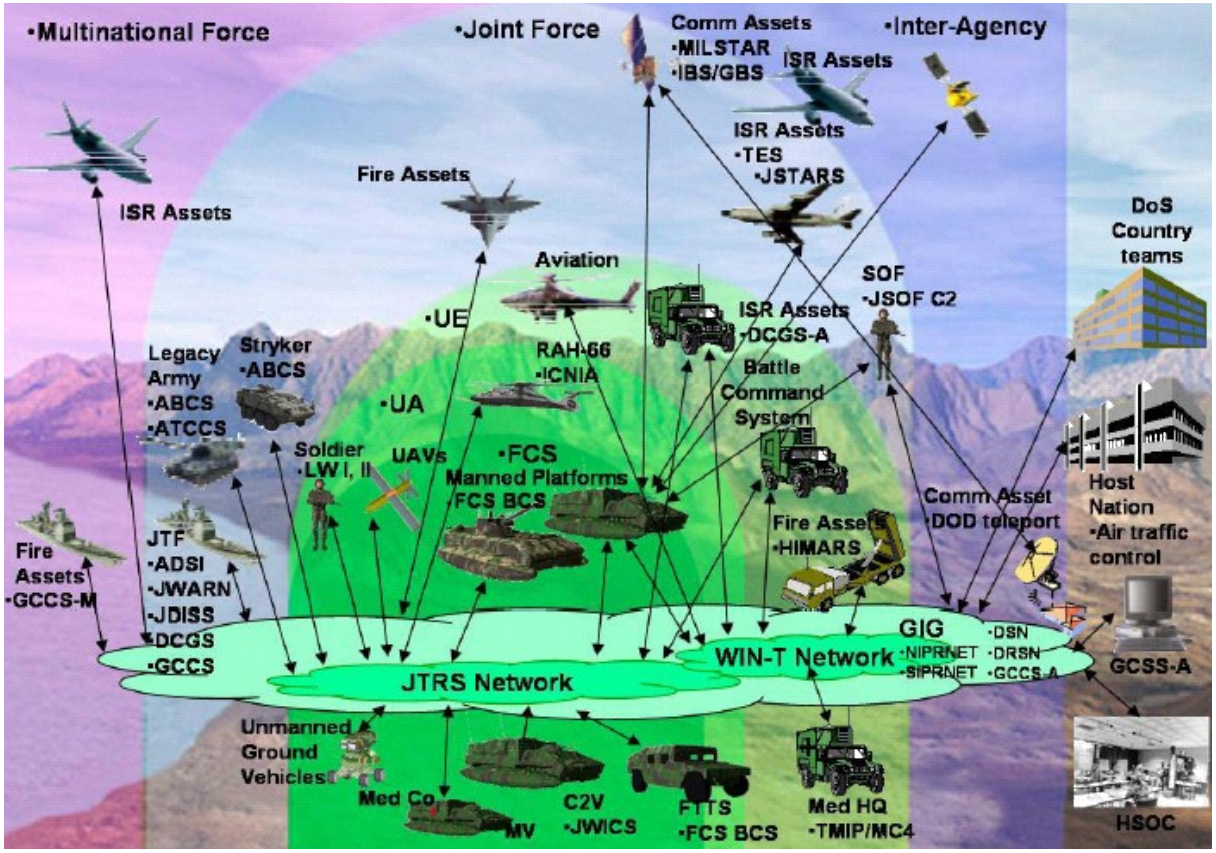

- **Requirements derived and allocated from an integrated architecture**
- **Developed by the "One Team" Partners**
- **Multiple integration objectives**
  - **Vertical**
  - **Horizontal**
  - **KPP Performance**
  - **U of E**
  - **Joint/Inter-Agency/Multi-**

Deliver an Integrated Unit of Action (UA) that is Integrated with the Unit of Employment (UE) and Interoperable with Current Army, Joint Operations and Multi-National Combined Operations

tested

System of Systems Integration

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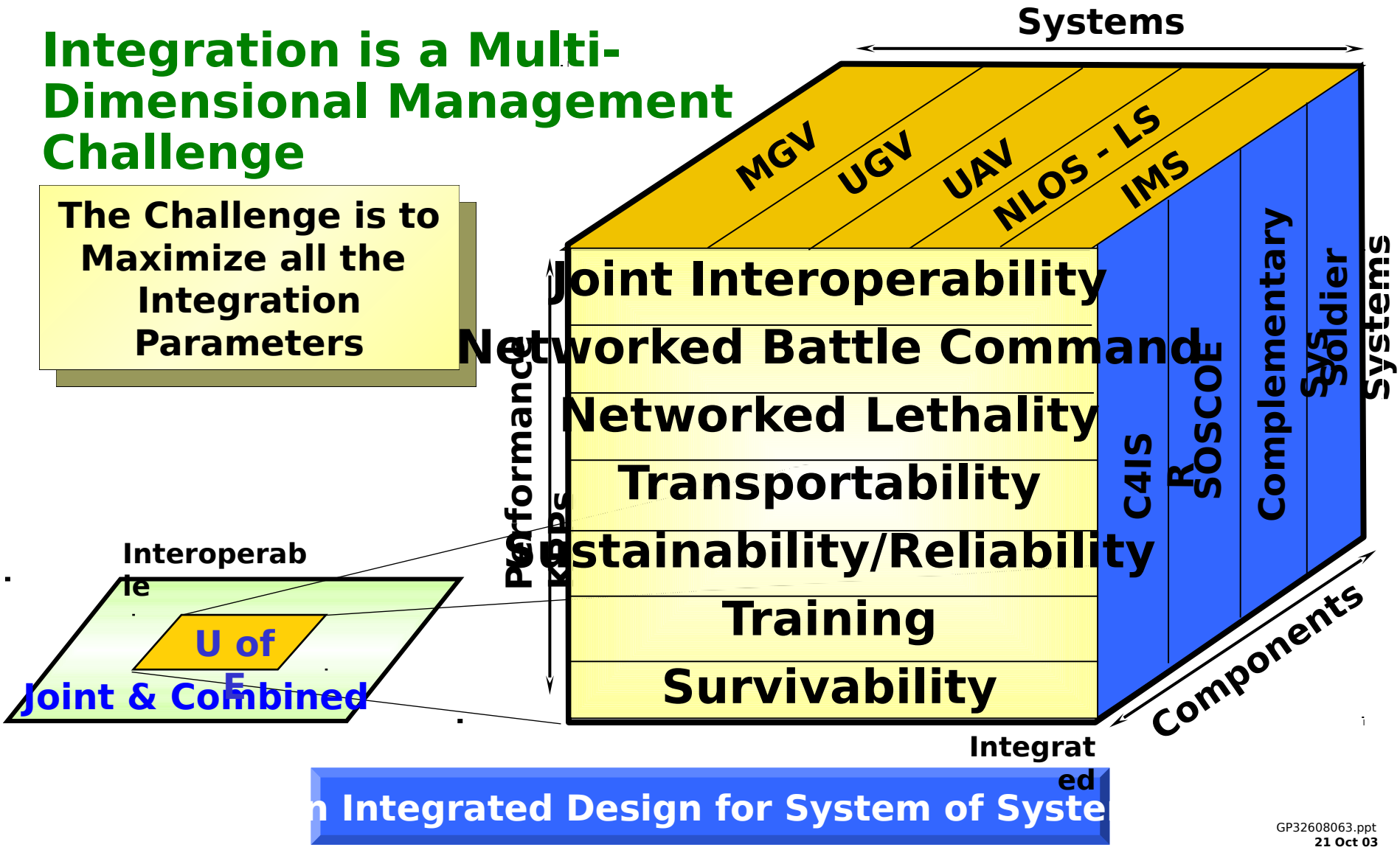
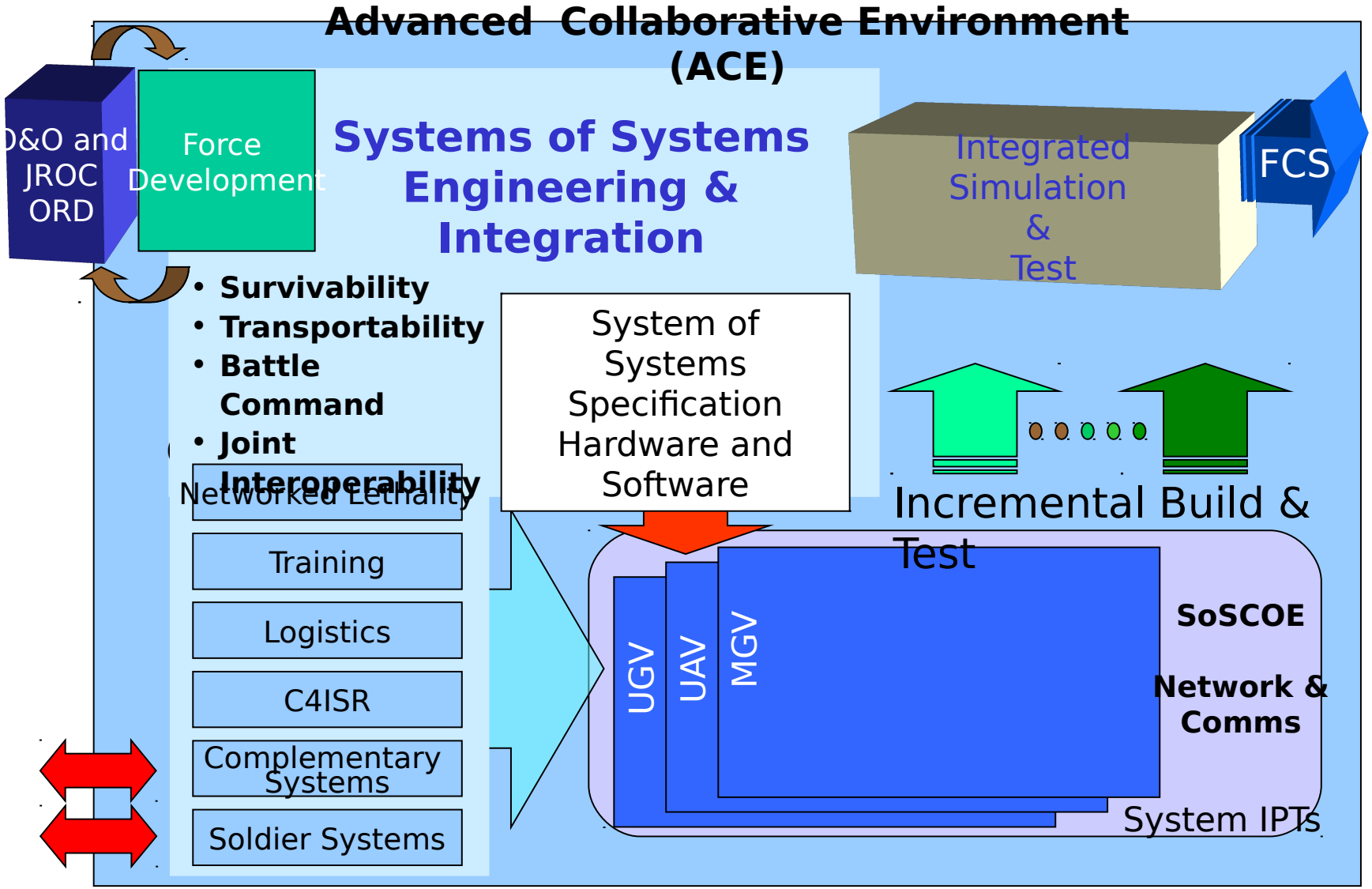
Integration is a Multi-Dimensional Management Challenge

The Challenge is to Maximize all the Integration Parameters



Organized for System of Systems Integration



Integrated Process Development

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Concept

30 June O&O

Scope of Architecture Integrated Processes

24 IP's

OV - 6C
Identify Critical Tasks (UJTL/AUTL/NEW) and Sequence in the Process

210 Critical Tasks

OV - 2
Identify Operational nodes Required to Enable Critical Tasks and Information Types That Must be Transmitted

- 8,847 Nodes
- 288 Information Types (Sensor data, CCIR, OPORD, etc)
- Up to 20 OV-2s For Each IP to Account for Echelons, Use Cases, Etc.

OV - 3
Develop Information Exchange Requirements (IERs)

824,724 IERs
17 Data Fields Each

OV - 1
Build Conceptual Portrayal of High Level Architecture for Each IP

IPs Focus Architecture by Defining Those Processes That Need Software of Hardware Development to Enable Concepts

45,000 Man Hours to Create

Each IP Shows Required Connections to Other IPs, Higher HQ, Joint HQs and Assets

The FCS Network …

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- **Provides the capabilities consistent with the 10 Big Ideas**
  - **Commander driven - purpose oriented - knowledge based - mission orders**
  - **Echelon of command is not the same as echelonment of unit formation**
  - **Battle command resourced for sustained operations**
  - **Battle command - anytime, anywhere**
  - **Teaming of commanders and leaders - on demand collaboration**
  - **Fully integrated: space to mud, factory to foxhole**
  - **One battle command system**
  - **Unprecedented information network dependability**
  - **Modular, scaleable, tailored battle command**
  - **Dramatically smaller deployed footprint**
- **Developed within the context of the future joint battlefield requirements (JC2, NCES, IPV6)**
- **A bottom-up materiel solution for the UA designed with UE applications under consideration**
- **A tool that provides improved capabilities which facilitate the art of battle command**
- **A solution that far exceeds the capabilities of the current force**

The Integrated - Interoperable U of A *Network-Centric Warfighting*

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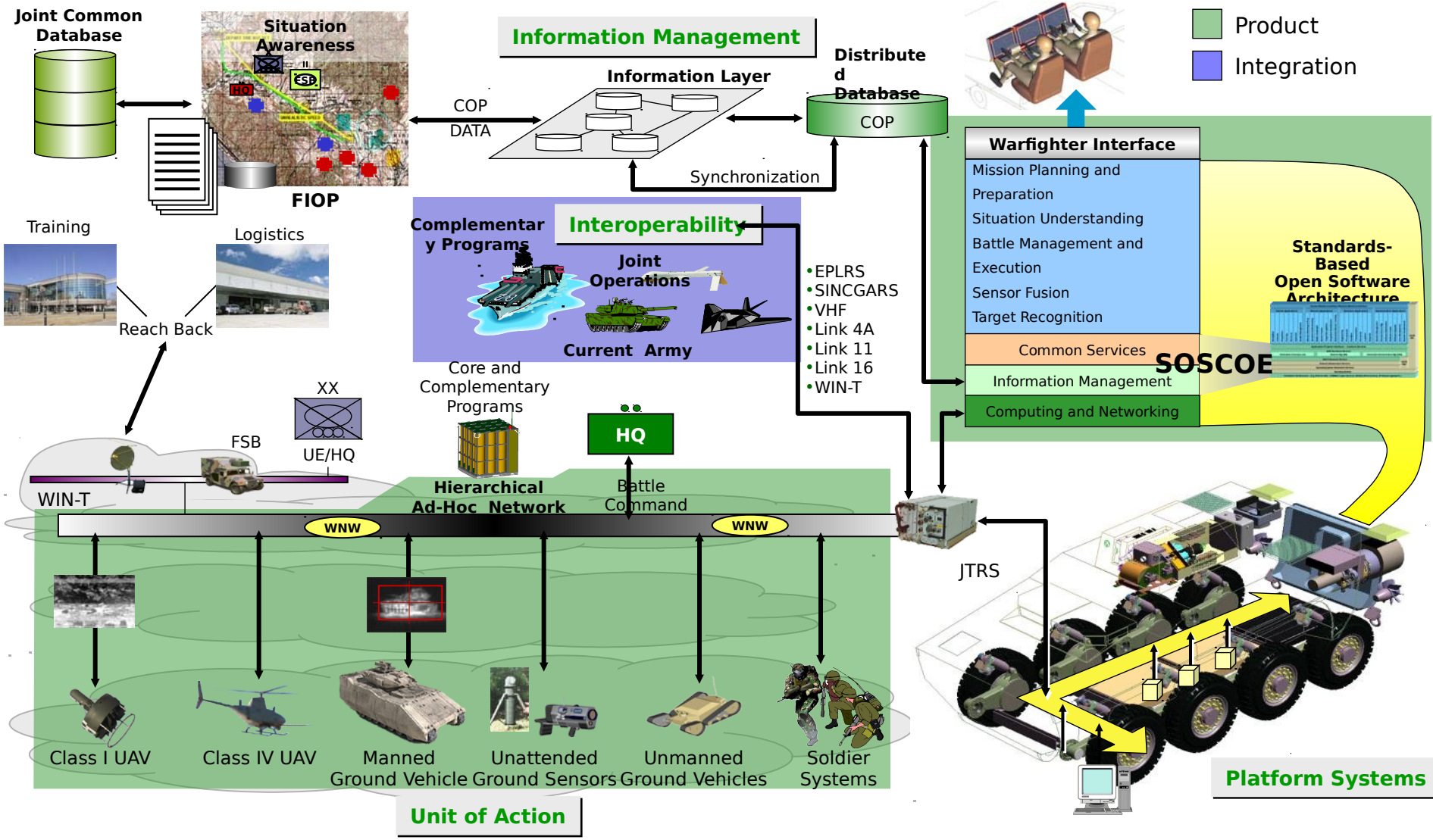

Network Product Development

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ISR Systems

Unattended Ground Sensors

Ground Penetrating Radar

Air Platform Sensors

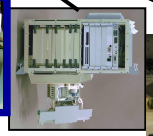
Ground Platform Sensors

AiTR Processor

R&SV Mast Long Range EO/IR Sensor Suite

Passive RF UAV Emissions Locator-Small

Class III/IV UAV RF Emitter Locator – Medium



Class III/IV UAV RF Emitter Locator-Medium

Class III/IV UAV EO/IR Designator & Countermine Sensor

Class I UAV EO/IR Sensor-Small

Short Range EO/IR Sensor Suite

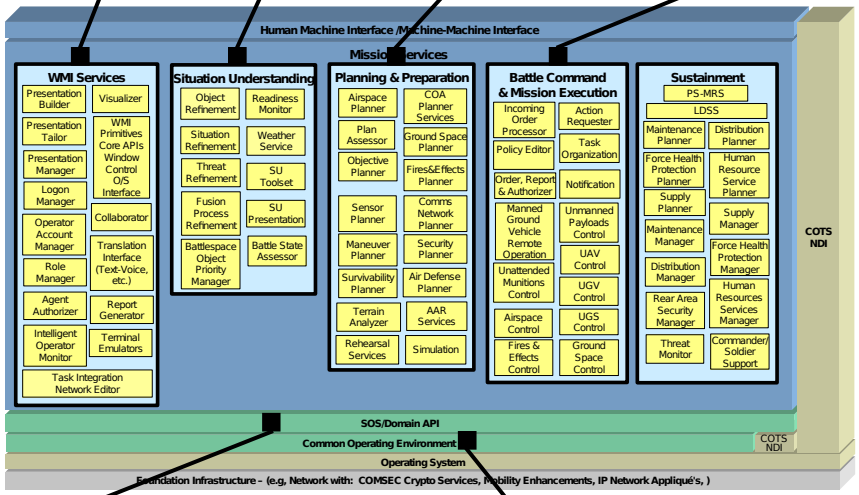
Battle Command Software

Warfighter Machine Interface

Situation Understanding

Mission Planning & Preparation

Battle Command Mission Execution

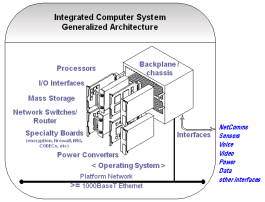


JTRS

Air Platform Comms

JTRS WIN-T

Ground Platform Comms



Integrated Computers

Applications
Transport
Internetwok
WNW Subnet
Signal in Space

Network Mgmt Software

Network Systems

System of System Common Operation Environment

Integration Enablers

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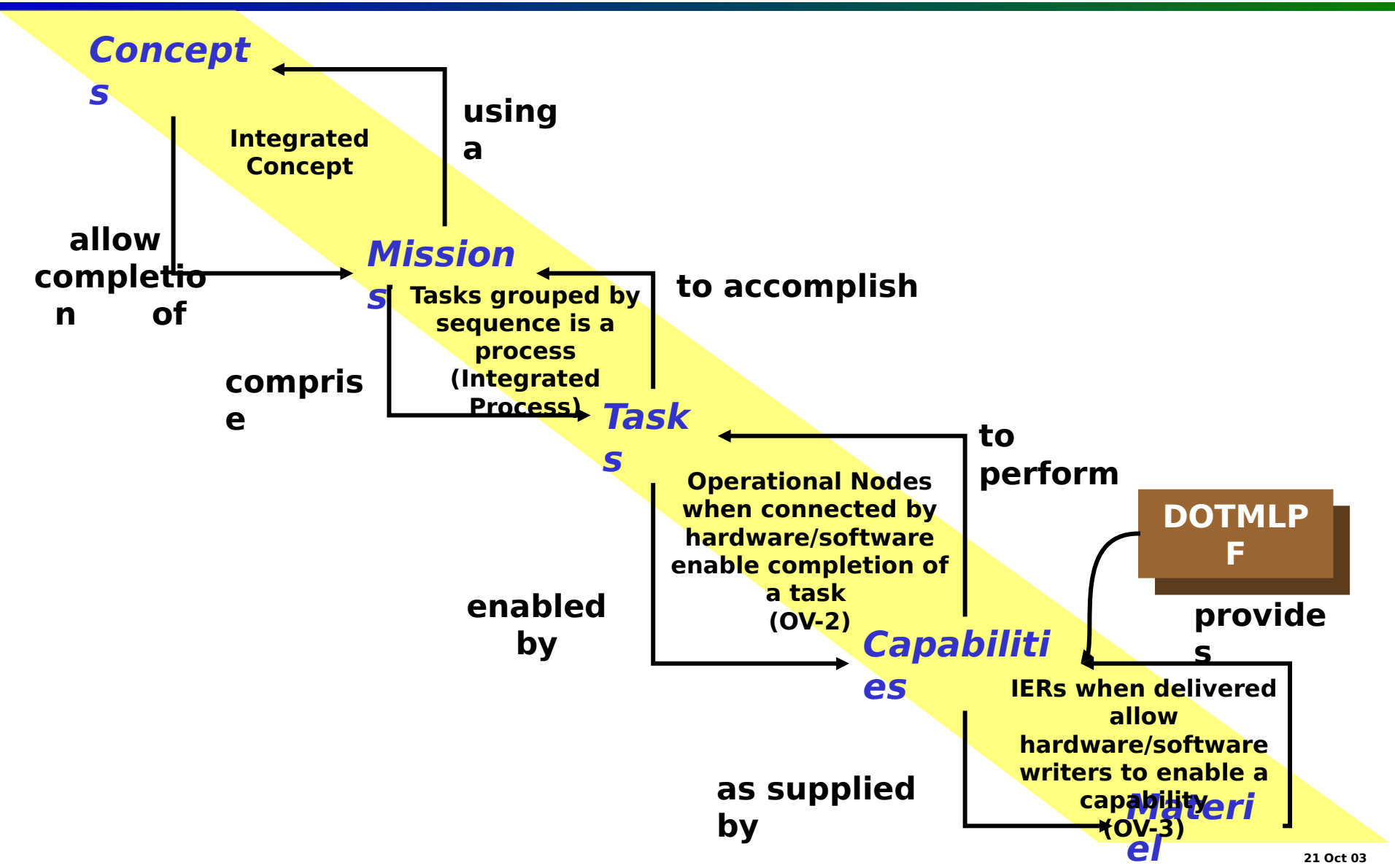
- **People**
  - Senior Integration Management Team
  - Requirements Working Group
  - Trade Study Working Groups
  - Interface Control Working Group
  - System Integration Working Group
  - Non-Advocate Review Groups
  - Risk Management Review Board
  - Configuration Control Board (CCB)
  - Program CCB
  - EVMS applied at all IPTs
- **Tools**
  - Architectures in Rational Suite
  - Requirements in DOORS
  - Government Models and Simulations
  - Integration Labs
    - Component Development Labs
    - C4ISR SIL
    - Platform SILs at Partner Sites
    - SoSIL
    - Field Tests

Structured Set of Integration Working Groups, Processes and Tools to Ensure Horizontal Integration Across the IPTs

Backup Charts

Task Decomposition to Derive IPs



The System of Systems IPs and Architecture: 'The Integration Model'

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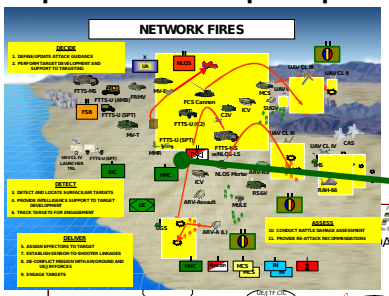
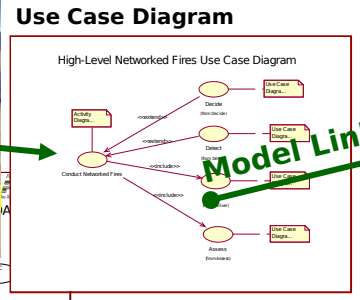
Operational Concept Graphics



Use Case Diagram



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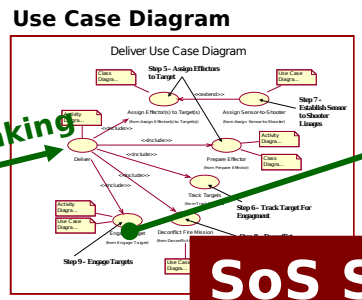
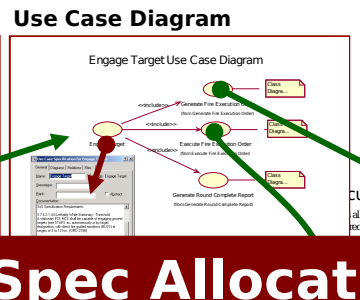
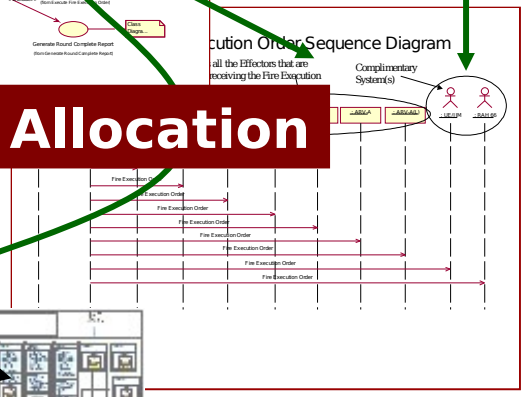


Use Case Diagram

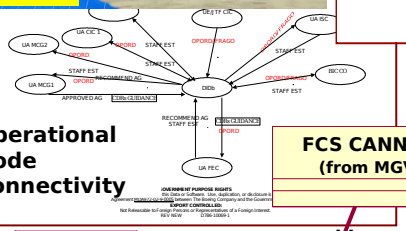


Model Linking

Complementary Systems

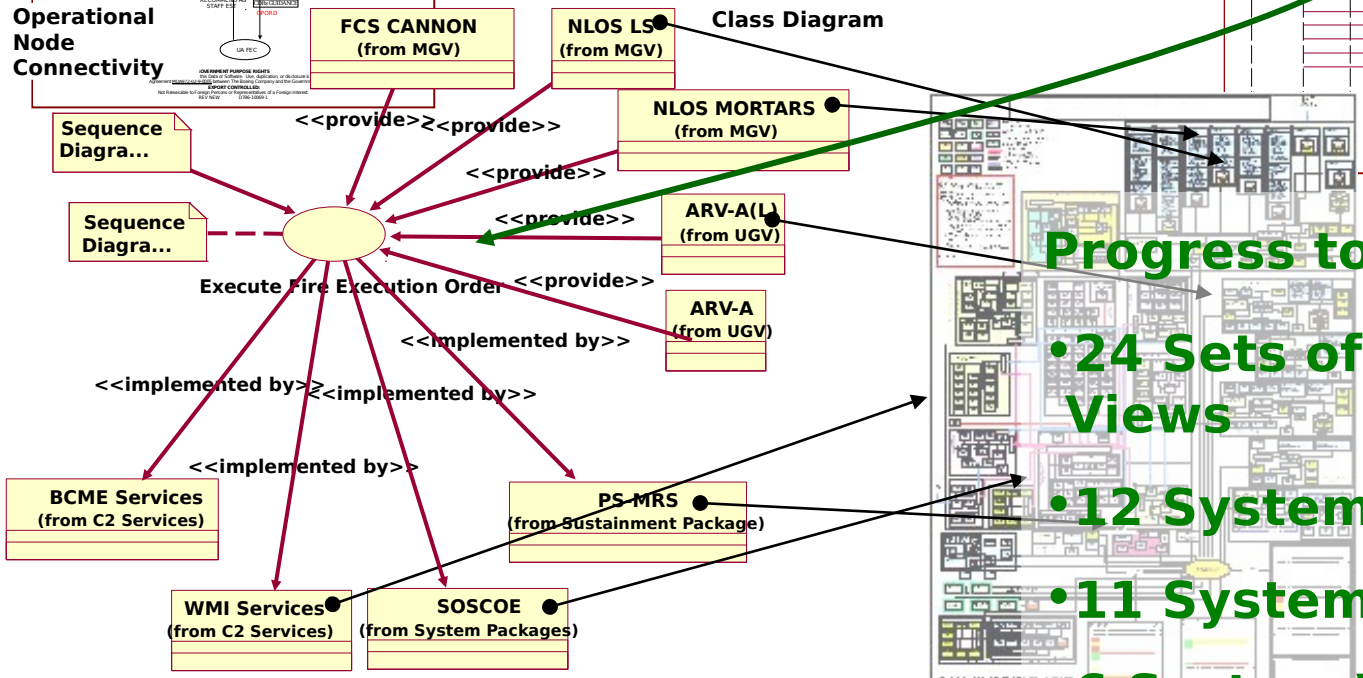


SoS Spec Allocation



Operational Node Connectivity

Class Diagram



Progress to Date

- 24 Sets of Operational Views
- 12 System Views – 4
- 11 System Views – 10c
- 6 System Views - 5

SoS Integrated Processes Map to C4ISR Products

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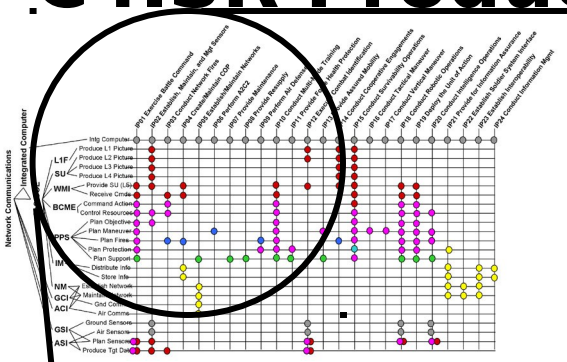


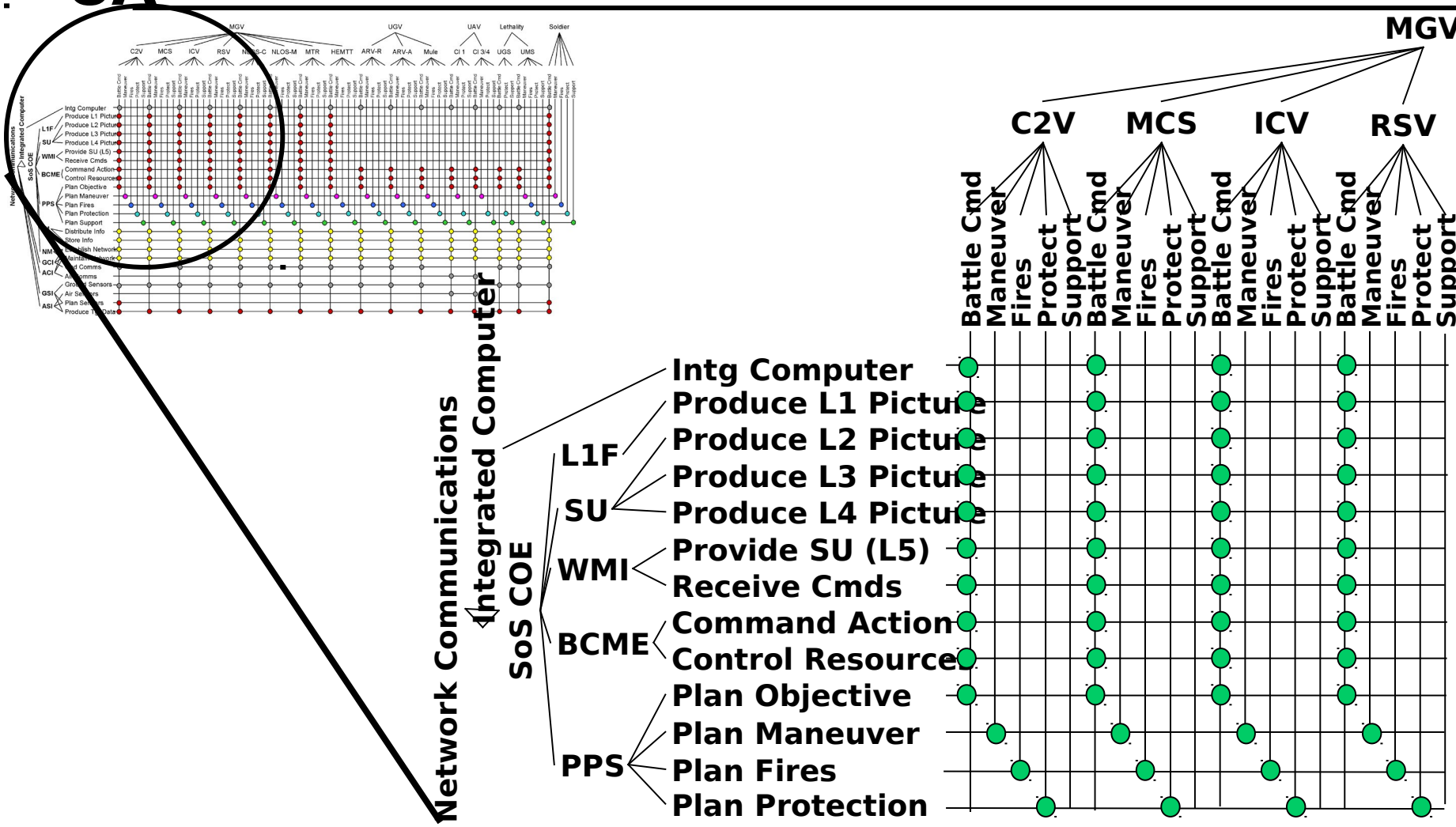
Network Communications
Integrated Computer
SoS COE

- Intg Computer
- L1F
  - Produce L1 Picture
- SU
  - Produce L2 Picture
  - Produce L3 Picture
  - Produce L4 Picture
- WMI
  - Provide SU (L5)
  - Receive Cmds
- BCME
  - Command Action
  - Control Resources
- PPS
  - Plan Objective
  - Plan Maneuver
  - Plan Fires
  - Plan Protection

IP01 Exercise Battle Command
IP02 Establish, Maintain & Mgt Sensors
IP03 Conduct Network Fires
IP04 Create/Maintain COP
IP05 Establish/Maintain Networks
IP06 Perform A2C2
IP07 Provide Maintenance
IP08 Provide Resupply
IP09 Perform Air Defense
IP10 Conduct Multi-Mode Training

C4ISR Products Enable the SoS Integrated Processe

C4ISR Products Map to FoS, SoS, UA



R Products Provide the Integrating Treads Within the FoS, SoS, UA and A